

Companies Forum

MR/x-ray/operating Suite Developed at Tokai University Hospital

Multidisciplinary Combination Enables Intraoperative MR Imaging

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Tokai University Hospital has been operating a magnetic resonance/x-ray/operating suite (MRXO) since 2006. Developed with the support of Philips Healthcare, the MRXO is an operating suite equipped with radiological diagnostic systems.

Mitsunori Matsumae, M.D., is Professor of Neurosurgery and Chair of the Department of Neurosurgery at Tokai University School of Medicine (Tokyo, Japan), as well as Neurosurgeon-in-Chief at Tokai University Hospital. Before the hospital was built, he helped develop a system for the new hospital in which MR, CT and angiography systems are all housed within an operating theater that can accommodate advanced surgery such as neurosurgery.

“We named this facility the MR/x-ray/operation suite (MRXO),” says Prof. Matsumae.

Smartly designed concept

The arrangement of the MRXO suite allows each machine to be used separately as a diagnostic device, or in combination to provide imaging for assisting a neurosurgical procedure. The system is located in the emergency department so that the emergency, radiology and neurosurgery departments can utilize radiological diagnostic systems efficiently. Its location allows the system to be used 24 hours every day; if it were in an operating theater, its use would most likely be limited to weekdays only.

The Tokai University Neurosurgery Depart-

ment – in collaboration with Mizuho Ika Kogyo Co., Ltd – developed a new MR-compatible operating tabletop comprising three parts with four joints. “This operating table and tabletop make it easier to perform intraoperative MR and allow operations – especially neurosurgical operations where the head must be raised – to progress smoothly,” says Prof. Matsumae.

The MRXO system uses MR (Achieva 1.5T with modifications*), CT (Brilliance 40) and angiography (Allura Xper FD20). During the first month following the opening of the hospital and installation of the MRXO suite, each diagnostic system was used separately to train the radiology technologists. Once they had acquired the skills to use each system, neurosurgery and interventional radiology (IVR) simulations using volunteers were performed repeatedly.

Intraoperative MR during neurosurgery

“As a neurosurgeon, I was fully aware of the significance of having an MR system in an operating room to monitor the progress of surgical interventions,” says Prof. Matsumae.

MR images that are updated during neurosurgery enable a surgeon to see anatomical structures and monitor changes occurring during the neurosurgical procedure. “For instance, we are currently using MR during tumor resections using craniotomy to determine the location of important nerves or blood vessels. By monitoring MR images that are updated during



Figure 1 MRXO crew.



Figure 2 Special MR-compatible operating table for neurosurgery and MR in the MR/x-ray/operation suite (MRXO) at Tokai University Hospital.

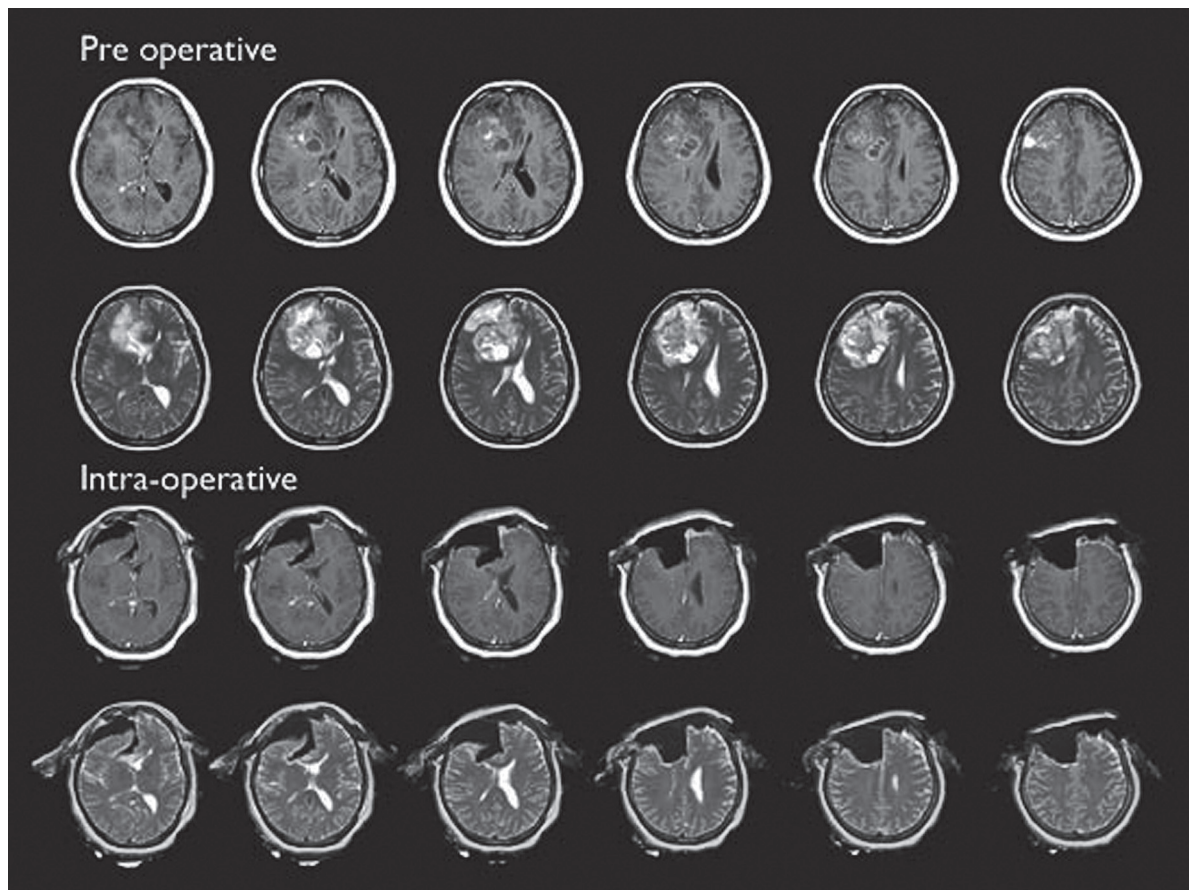


Figure 3 MR images obtained before and during neurosurgery in MRXO.



Figure 4 Layout of MRXO.

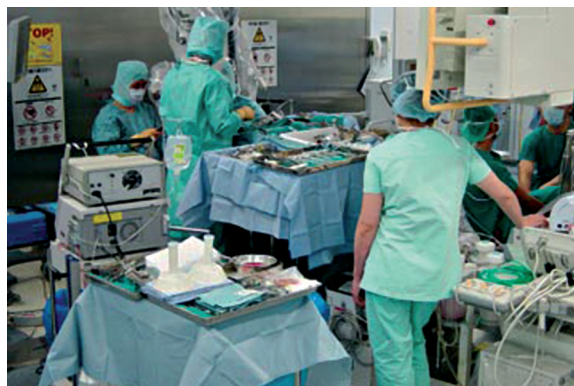


Figure 5 Safety check prior to moving the bed into the MRXO.

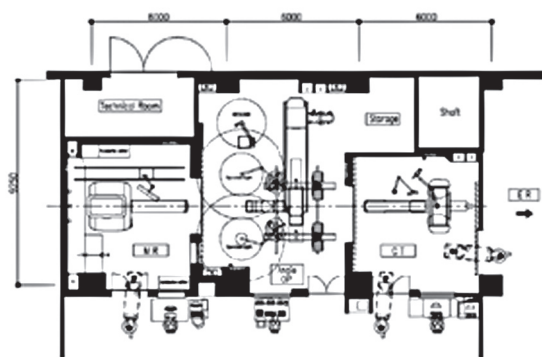


Figure 6 Neurosurgical procedure in MRXO.

surgery, we can remove cerebral lesions as completely as possible.”

At present, one to two operations are routinely performed for neurosurgery and for IVR in the MRXO each week. A noteworthy point is that the suite is located in the ER, and as a result, approximately 40 CT scans, 16 MR scans and one angiography are performed each day. This efficient and routine use of the diagnostic machines illustrates the features of the MRXO suite very well.

Versatility of MRXO

The MRXO suite is currently used for interventional radiology procedures, intraoperative MR and angiography for neurosurgery, but ap-

plications may broaden in future. The MRXO suite has multiple modalities that can be used individually, but can offer combinations of modalities as well, namely, MR and surgical function, surgical function and angiography, surgical function and CT, MR and angiography, angiography and CT, MR and CT and more. In addition, the MRXO can be further developed into a high-end suite by incorporating PET-CT and/or 3.0T MR.

**Not commercially available.*